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MEMORIAL NUMBER

FOR

SAMUEL JAMES MELTZER, M.D.

FOUNDER

AND

FIRST PRESIDENT

OF THE

SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE

ADDRESSES GIVEN AT A MEETING OF THE SOCIETY HELD AT THE ACADEMY OF MEDICINE, JANUARY 6, 1921, IN ASSOCIATION WITH THE NEW YORK ACADEMY OF MEDICINE AND THE HARVEY SOCIETY OF NEW YORK

NEW YORK
1921

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SAMUEL JAMES MELTZER, M.D.

Born, March 1871—Died, November 7, 1920.

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PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

Minute expressive of the sentiment of the Society for Experimental Biology and Medicine on the death of Samuel James Meltzer.

The Society for Experimental Biology and Medicine has been deeply moved by the death of its revered founder, Samuel James Meltzer, who, from the beginning of its career, was the Society's devoted mentor and the personification of the Society's spirit and ideal.

Meltzer was eminent for many important contributions to biology, physiology, pathology, pharmacology, and scientific medicine. Most of his contributions to the advancement of science, after the Society's establishment in 1903, were made originally at meetings of this Society.

He was a distinguished promoter of the application of *experimental* methods to research in American medicine. His foundation of this Society was a particularly important means of accelerating that significant development in this country.

He was an enthusiastic embodiment of the spirit of zealous research, and an ardent exponent of idealism in science and in service.

He inspired fidelity to truth. He stimulated achievement in research. By example and precept, in the meetings of this Society for seventeen years, Meltzer appealed always to the best in every member. He quickened, in the oldest as well as in the youngest members, the impulses of emulation of his sterling qualities as a man, as an investigator, and as a servant of truth in every relation, that such attributes as his invariably elicit when radiated from an unselfish leader.

Meltzer's memory will be a continuing inspiration to the members of this society. Proceeding actively along the path his faithful leadership opened to us, and growing steadily in usefulness and strength, our Society will be not only an enduring monument but also a living testimonial to his achievements, his influence, and his character.

Deeply conscious of the personal loss that Meltzer's death involves for each of us, but earnestly grateful for the abiding

value of his unbroken influence in our hearts, we dedicate ourselves anew to the promotion of the principles that Meltzer exemplified; and we are more firmly resolved than ever so to support and cherish this society that it may continue to be a worthy agency, of cumulative effectiveness—as Meltzer projected it—for the active advancement of science, for the exaltation of truth, and for the ennoblement of service, in biology and medicine.

Presented by the council and approved by the Society, at the one hundred and fourteenth meeting, held on March 16, 1921.

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Dr. Meltzer's relation to the Society for Experimental Biology and Medicine.

By HOLMES C. JACKSON, Secretary.

After twenty years of active investigation in experimental medicine and allied branches, it was quite natural that the scientific ideals of Dr. S. J. Meltzer should express themselves in a desire to form a society whose main purpose lay in stimulating experimental work among the younger men entering the fields of biology and medicine.

Accordingly, in conjunction with Dr. Graham Lusk, Dr. Meltzer sent an invitation to eight New York investigators to meet at Dr. Lusk's house on January 17, 1903, for the purpose of establishing a "Society for Experimental Biology and Medicine." This preliminary conference unanimously endorsed Dr. Meltzer's views and appointed a committee for permanent organization. The charter membership was increased to nineteen and the first meeting occurred on February 25, 1903, in the laboratory of physiological chemistry, College of Physicians and Surgeons, Columbia University. Dr. Meltzer became the first president of the new society and served two years.

Dr. Meltzer's first thought was to have the scientific program of the meetings presented in the form of demonstrations, and this idea was carried out during the first two years. As the society grew and the number of papers read at the meetings became greater, it was found necessary to alter somewhat this original intention so as to allow papers to be read by title.

During the first three years, the reports of the meetings of the Society appeared in *Science* and in *American Medicine*. In June, 1906, the decision was reached to publish the PROCEEDINGS as a separate journal, one number appearing after each meeting. The PROCEEDINGS has now established itself as a well-recognized and much sought for avenue of early publication for preliminary communications with an edition of 700 copies reaching all parts of the world. The meetings of the society have been held monthly

each year from October to May inclusive, at the various educational institutions in New York City. In several instances out of town meetings in May were arranged at New Haven, Connecticut and at Cold Spring Harbor, New York.

Dr. Meltzer was a constant attendant at these meetings, adding immensely to their value by kindly discussion of the papers and by his clear cut and pointed criticism. His knowledge of literature was surprisingly accurate, diverse and extensive. He was a great reader and his retentive memory held all that came to his mind.

As a member of the council he gave much of his thought and energy to the various changes in policy which became necessary from time to time. To his mind the society functioned as a stimulus to scientific effort for the younger men in the various fields of biology and medicine. With this in view, he suggested the formation of branch societies in different parts of the country. Two of these branches, one on the Pacific coast and one in Minnesota, now meet every two months. Papers read at these meetings are published in the PROCEEDINGS. Dr. Meltzer lived to see the membership of the society become world wide and grow from fifty-six at the end of the first year, to four hundred and ten in 1920. Membership in the society is now recognized as a mark of scientific attainment; eligibility requires the publication of a "meritorious original investigation in biology and medicine by the experimental method."

Dr. Meltzer's death occurred on November 7, 1920. The funeral took place on November 10 from the Ethical Cultural Church, at which Dr. Simon Flexner and Dr. John Lovejoy Eliot delivered memorial addresses.

At the December meeting of the society it was voted to hold a memorial meeting at the Academy of Medicine in association with the Academy and the Harvey Society of New York. This meeting was largely attended; the president of the Society, Dr. Calkins, presided and addresses were given by Dr. George B. Wallace, Dr. Phoebus Levene, Dr. Graham Lusk, Dr. William H. Howell and Dr. William H. Welch. These addresses are printed in this memorial number of the PROCEEDINGS of the society.

Dr. Meltzer's example was a constant stimulus to the younger

generation with which he came into contact, and the society feels deeply the loss which it has sustained by his death. The hand which guided the destiny of the society in the selection of its officers and members is no longer active. It is for others who remain to take up his task in holding fast the ideals which he impressed by his personality upon the society and its members.

Memorial remarks.

By GARY N. CALKINS, President.

Nearly eighteen years ago, or to be more precise, on the 17th of January, 1903, a small group of men, on the invitation of Dr. Meltzer, met to discuss the formation of a new society for the purpose of encouraging experimental work in the biological sciences. The following month the Society for Experimental Biology and Medicine was launched with 19 charter members, and Dr. Meltzer was its first president.

One of the most characteristic and lovable traits of Dr. Meltzer was his interest in young men and their progress in science. He saw in the National Academy a meeting place for those who had reached established heights in research and he liked to think of his new society as furnishing an opportunity for young men, fledglings in science, to try their wings. Always helpful to them with advice and by example, and always mindful of the highest ideals of scientific research he not only fathered the new society but he nursed it through its period of youth and watched its later growth with a jealous eye to see that the high standard of aims and ideals which he had set for it were maintained.

We meet tonight to do honor to his memory. The young society has grown and we believe, as we like to think, that his scientific spirit extends today throughout the entire membership of nearly four hundred active workers, and we like to think that the nickname which the Society early received—the Meltzer Verein—is synonymous with scientific idealism.

In recognition of this scientific spirit, and in respect to the memory of Dr. Meltzer, I am going to ask the members of the Society, and all others present who think as we do, to rise and remain standing for a few seconds.

A tribute to Dr. Meltzer's life and services.

By GEORGE B. WALLACE.

As the first speaker this evening and one who, through a friendship of some twenty years, has been largely influenced by Dr. Meltzer, I may be permitted to sketch in a somewhat general way those characteristics of his life and work which have especially impressed me.

My acquaintance with Dr. Meltzer began in the spring of 1902. At that time Professor Cushny was passing through New York and together we went, on what seemed to me a pilgrimage, to call on Dr. Meltzer at his house in Harlem. The visit stands out very clearly in my memory. Dr. Meltzer was then in his fifty-first year, in the full vigor of life and carrying on an extensive hospital and private practice. The conversation, however, was not concerning practice, but mainly on research work, his own and that of others. I recall how greatly I was impressed by his knowledge of the scientific work being carried on, by the clearness and fairness of his criticisms, and by his general enthusiasm and optimism. He dwelt at some length on the state of medical science in New York and deplored the isolation of the individual workers and their failure to meet at frequent intervals to present their work and exchange their ideas. Apparently this had been in his mind for some time, for he outlined a plan for the formation of a society which should include all the active workers in the biological and medical sciences. In the following year Dr. Meltzer put this plan into effect, and with the coöperation of a small group of his friends, the Society for Experimental Biology and Medicine was formally launched.

One of the last occasions on which I saw Dr. Meltzer was at a meeting of the Society held last spring in New Haven. He was then in his seventieth year and in miserable health, but his enthusiasm was as great as it had been twenty years earlier, and he had made what to him must have been a long and trying journey because of the intense interest he had in the society and in sci-

entific work. As we walked very slowly and carefully back to his hotel, he told briefly and rather casually of the bad attack he had had the previous night, for which he had been obliged to call in a local physician, and then went on to describe the excellence of the meeting, the great field covered by the papers, and the fine spirit which was prompting the research work done in this country. This spirit, which he was so quick to see and appreciate in others, was, as a matter of fact, especially exemplified in his own life and work, and one feels in looking over his career, that it must have been the great driving force throughout his whole life, which made him indifferent to obstacles, difficulties and physical infirmities, great enough to daunt the ordinary man.

It can be truly said of Meltzer that he was a man who loved and pursued knowledge for its own sake. This was an inherent characteristic. When he entered the University of Berlin in 1876, it was the study of philosophy that attracted him particularly and it is probable that had his financial prospects been more favorable, he would have kept himself within this field, stimulated as he was by such eminent teachers as Paulson and Erdman, and by his quickly formed friendship with Steinthal. Moved by financial considerations, however, he entered at this time into the study of medicine. This was a day of great teachers and the University of Berlin was unusually fortunate in this respect. It is not difficult to see how the eager mind of young Meltzer must have been stimulated and indelibly impressed by contact with such masters as Du Bois-Reymond, Virchow, Leyden and Frerichs. It was at this time also that he began a friendship which influenced all his later life, namely, that with Kronecker. With his attractive, friendly personality, his thorough training in physiology under Helmholtz and Ludwig, and in medicine under Traube, his devotion to experimental science, Kronecker was the ideal guide and friend for the younger man just beginning a scientific career.

Shortly after his graduation, Meltzer came to New York and began the practice of medicine. He chose America, after careful deliberation, because its democratic form of government especially appealed to him. Previous to his settling in New York, he made several trans-Atlantic trips as a ship's surgeon, and his determination is shown by the fact that, in spite of his being a poor sailor

and seasick during the greater part of each trip, he kept this position and carried on its duties for some time.

With the environment in which his medical education began, it is small wonder that Meltzer's interest turned to research work. What especially impressed him from the beginning was first, the necessity of careful observation and thoroughness in work, and, second, the importance of facts rather than theories. Those who have heard Meltzer present experimental work will, I think, recall numerous instances in which, when pressed for an explanation of his results, he has replied that although he had a theory, it was only the fact itself that he wished to bring out.

He began his research work in Kronecker's laboratory while yet a medical student. This work was on the swallowing mechanism and he himself was the subject of experimentation. He has given a graphic account of the discomforts endured during these experiments, for he was obliged to sit for hours with two stomach tubes, with rubber balloons attached to their ends, inserted into his esophagus. There is an interesting side-light connected with this work. While carrying on his experiment one day, the laboratory was unexpectedly visited by the Prussian Minister of Education, who inspected the laboratory and Meltzer in particular. The explanation of the visit came later. An anti-vivisection bill had been proposed, backed by the statement that experimentalists would not dream of inflicting on themselves the discomforts to which they were subjecting animals. The Minister was able to report that he himself had just witnessed a voluntary experiment on a human being which was attended by the greatest discomfort and he ventured the assertion that none of those who were so earnestly advocating the bill would be willing to put themselves in the place of the student in physiology. It may be added that the bill was defeated.

It was while engaged in this work that an idea was brought out, upon which most of his subsequent work centered. This was the phenomenon of inhibition. He had obtained a record of a single swallowing movement, but found that with successive repeated swallowings the record changed completely, in that the contractions failed to appear. In his perplexity he appealed to his friend Kronecker, who suggested the possibility of inhibition.

This possibility was eagerly seized upon and developed. It came in time to be the central idea upon which a large part of his research work was based. Briefly stated, his conception was that inhibition is as essential a process in cellular activity as is excitation. All living tissues are irritable, *i.e.*, they respond to stimulation with a vital reaction. This reaction can be either the manifestations of their specific activity, excitation, or it can be an inhibition of an existing activity. Absolute rest occurs when both opposing energies are exactly even and the difference between activity and rest consists only in the fact that excitation predominates during activity and inhibition during rest. To support his conception, Meltzer turned his attention to experimental proof. His studies on respiratory function strengthened his belief, as did his work on the gastro-intestinal tract. Later in his search for an agent causing inhibition, he discovered the depressing properties of magnesium and found in this substance what he believed to be the representative of inhibition in the animal body. His numerous papers on the action of magnesium salts are too well known to need review.

It may be noted here that owing to his wide knowledge gained through years of practice, he endeavored whenever possible to utilize his experimental facts for the service of humanity. Thus he pointed out and devised a technic for the use of magnesium sulphate as a general anesthetic and in the treatment of tetanus. He described its advantages in the treatment of burns and its application in the diagnosis of gall bladder disease. Suggested by the magnesium work, he turned his attention to artificial respiration and devised his method of intratracheal insufflation, a method notable for its simplicity, effectiveness and wide application.

In Meltzer's research work in general there is seen a breadth of view and range of subjects that is remarkable. In his earlier publications, as might be expected, there are found a number of papers on clinical subjects. Thus he wrote on the auscultatory sounds of swallowing, subphrenic abscess, congenital hypertrophic stenosis of the pylorus, otitis media and earache in pneumonia, paratyphoid, mechanical relations in the occurrence of pneumonia, myelopathic albuminosuria, gastralgia, intestinal colic and colic in general. These papers all show a keen observation and careful interpretation of facts.

From the outset, however, his interests were in purely scientific subjects. His first publication on the swallowing mechanism, with Kronecker, has been mentioned. Shortly after his arrival in this country he published with Professor Welch a paper on the behavior of the red blood corpuscles when shaken with indifferent substances. In this connection he was again fortunate, in forming an enduring friendship with Professor Welch, a friendship based on mutual respect and devotion to science. This paper was the forerunner of a large number on physiological subjects, too numerous to mention individually, which set a standard for American work and served as a stimulus for a great quantity of work by others.

There is another side of Meltzer's career which should receive special recognition. I refer to his part in shaping and hastening the development of scientific medical work in this country. Although the Society for Experimental Biology and Medicine, known affectionately as the "Meltzer Verein," held his particular interest, he was a leading figure in the organization of most of the present day American societies for medical research. His advice in matters of organization, policy, selection of members, was freely given and its value recognized. Of a highly altruistic spirit, his large experience and good judgment kept him from being impractical. His progressive point of view in all these matters is clear to one who reads his addresses, generally presidential ones. I quote as an example, extracts from his presidential address delivered before the Association of American Physicians. "The best physician of the future will be the man who has spent years in studying the methods employed in acquiring knowledge in the pure medical sciences and then in applying all his mental energies to a broad study of disease." "Clinical medicine and medical sciences must be brought closely together and work in harmony; that will assure a steady progress of the science and practice of medicine." "Some older members complain that the papers presented at the meetings are getting above their heads. While this may be a fact, it cannot be made the basis of a complaint. The papers of the program of our annual meeting reflect in general the character of the medical studies which prevail at that period."

Dr. Meltzer was especially instrumental in bringing about

the formation of the American Society for Clinical Investigation, a society made up of younger men, active workers in medicine. This society is unique among medical organizations, in the character and ability of its members and the scientific excellence of their work. It is unquestionably one of the most important influences in this country in the progress of clinical medicine. His address at the first meeting of this society on "The Science of Clinical Medicine, what it ought to be and the men to uphold it" is an especially inspiring one, and sets forth fully the ideals for which he was fighting. Again a paper on "Headship and Organization of Clinical Departments" shows his conception of what the organization of a modern department of medicine should be. Through all these addresses one can find proof of his firm conviction of the successful future of medicine in this country. He had full faith in the new generation, with its education and scientific training.

I take the opportunity of quoting here a letter, recently received from Dr. Victor C. Vaughan, which reflects the general regard in which Dr. Meltzer was held by men of his own type. "I know of no one within my wide circle of acquaintances who has more fully filled my ideal of a physician and investigator than Dr. Meltzer. Although busy in the practice of medicine for many years, he always found time to do research, and this was of the highest kind. Personally I loved him like a brother. Professionally I appreciated his great service to science and to his profession."

And again, I quote from a letter received from Professor Yandell Henderson: "I believe that I can, as well as almost any one, testify from my own experience in scientific discussion with Dr. Meltzer, to the value of his constructive criticism. To excite comment on one's work from Dr. Meltzer was to receive at once stimulus, guidance, encouragement, and warning against premature conclusion. The function of critic which he filled for twenty years or more was one of his most valuable services."

In concluding, I feel that I can speak for the large group of men, young when Meltzer was in his full maturity, who looked on him as a sympathetic friend, a trusted adviser, an exponent of that spirit and accomplishment for which we are all striving.

Dr. Meltzer's message to the present generation.

By PHOEBUS A. LEVENE.

I am here tonight to speak not to the old friends of Dr. Meltzer who with him led the medical profession through the thorny walks of a primitive lowland to its present heights of splendor, I am here not to revive old memories so that some may again pass through the joys of their youth. I have come to speak to the younger, to deliver to them the message bequeathed by the older, Dr. S. J. Meltzer. And in order that they may receive the message I shall attempt to draw a sketch of the departed friend and master, not one portraying every detail of his character, not one bringing out every feature of his activities, but an impression portrait such as the young may hold before them while their life and ideals are still in their shaping. I shall throw the light on the side of the man that is the expression of the great ideal of service to humanity. The form of service is truly an incident.

It so happened that Dr. Meltzer was born in Russia, a country of irrepressible idealism; it so happened that he was born of a race noted for its devotion to whatever it chooses to make the object of its devotion; it so happened that he was born in a small modest town that gave birth to no bankers and to no magnates, but to many men of learning. Unlikely as this may seem, learning was the object of veneration in Dr. Meltzer's birthplace and learning became Dr. Meltzer's ideal.

In search of learning Dr. Meltzer migrated to Berlin, where he came under the influence of the great masters of medicine, of physiology, and of philosophy. In the atmosphere of these men his character matured, his ideals took concrete shape. Here the decision was formed that medicine was to become the medium of his service to man and here he chose physiology as the medium of self-perfection and of personal enjoinment. So earnestly did Dr. Meltzer apply himself to the task of mastering his medium that soon he gained not only appreciation but also the friendship and affection of those who had been his masters; and then, still

early in his career, he was offered an opportunity of an academic position in Berlin. However, circumstances, among which not the least was an impelling desire for broader activity, induced him to decline the offer and again to migrate, and this time to our land.

With a background of Virchow, Helmholtz, DuBois Reymond, Koch, Frerichs, etc., Dr. Meltzer entered New York and on his arrival the contrast of past and present was not very cheering. Medical schools we had, but seats of learning they were not. Theory was not held in great repute, the largest space given to the laboratory was that occupied in announcements. On the school premises it was discovered with difficulty. The material the schools turned out was not of very high grade, but, such as it was, it formed the medical world which young Meltzer was about to join. Here to excel and to turn personal superiority into material gain was not difficult. Many men to whom Fortune was as friendly as to Dr. Meltzer, and who obtained the advantages of a European training, exploited their advantages successfully. Such success did not tempt Dr. Meltzer. On the contrary, from the day of his landing in New York his life was dedicated to the education and the advancement of the mental horizon of the American physician. There were other contemporaries who espoused the same cause, some were of American birth and had the advantages of a European education, and others of foreign birth and education. Prominent among them stand out Welch, Prudden, Janeway, Jacobi, Knopf in this city, again Welch and Osler in Baltimore, and others in other cities.

But among all these leaders who brought American medicine to its present high stand the place of Dr. Meltzer was from first to last unique.

To define his place among other leaders briefly, one would say it was more democratic. While others worked for the improvement of medical school or hospital, Dr. Meltzer chose for his task the education of the rank and file of M.D.'s, whether they were engaged in the practice of medicine or in the teaching of it. Again to borrow a term from the political vocabulary, Dr. Meltzer became the leader of the progressive opposition minority against the conservative majority. In order to exert his influence with the utmost efficiency, Dr. Meltzer chose to preserve his personal

independence and because of this for many years he remained unaffiliated with school or hospital. Above that of personal independence, Meltzer held the necessity for leadership of one's continuous participation in active experimental investigation. Other leaders, whether educators or practitioners, early abandoned their habit of research. Over them Meltzer had an advantage. He also possessed the advantage of an indomitable craving for reading, and the advantage of a phenomenal memory.

Thus it happened that unaffiliated, holding no official position, Dr. Meltzer became the feared critic and the recognized leader and teacher both among the men of science and the men of practice. And often when new ideas and new discoveries in medicine had to be introduced to the American public, Dr. Meltzer was called upon to perform the task—and he always lived up to the occasion. His success in this direction lay in the fact that he never presented a subject before he assimilated it by experiment in the laboratory. Thus he labored and toiled to attain self-perfection and through self-perfection to aid and teach those around him.

Dr. Meltzer was one of the few men favored by Fortune who lived to see his efforts crowned with success. While his mental and physical energies were still in full vigor, the standard of the medical profession of America rose to unexpected heights. Dr. Meltzer could then devote more of his energies to his personal joys, things nearest to his heart—they were his old problems of physiology; old and many new. The opportunity presented itself with the foundation of the Rockefeller Institute. What he accomplished there, constitutes an important chapter of American medicine and more competent persons than I will give you an account of it. To me, however, tonight, his scientific contributions speak second and his life first. It was a simple life, simple in its dignity and honesty of purpose, magnificent in the humble manner of its great service to man and to ideal. The record of his life is the message Dr. Meltzer leaves not only to his colleagues, not only to the medical profession of America, but to all.

Personal reminiscences of Dr. Meltzer.

By GRAHAM LUSK.

A friendly personality so long a constant attendant at every important meeting of this Academy of Medicine has passed from us in the fulness of years and in the honored esteem of his fellowmen. Meltzer was born in Russia, educated in Königsberg, and then studied philosophy and medicine in Berlin between 1875 and 1882. In 1883 he came to New York and began the practice of medicine. He was deeply imbued with the scientific spirit of modern German medicine and was also a highly skilled practitioner.

At one of the clinics in Berlin, so he once told me, a patient was brought into the amphitheater and he, a student sitting in the top row of the circle of seats, was asked to make the diagnosis, to which he quickly replied that the trouble was cancer. "Nein," replied the professor. The question was put to several others who gave other interpretations and finally again to Meltzer who replied, "I told you, Herr Professor, the patient has cancer." A vigorous "Nein" was the rejoiner, the patient was passed from the room and the professor said, "Herr Meltzer, the patient has *carcinoma ventricularis*, but never allow yourself to tell anyone that he has a fatal disease." This, Meltzer said, he had carried with him as a lesson all his life.

Meltzer was not content to cultivate a lucrative practice at the expense of the extinction of his extraordinary, inquisitive mind. So one finds him taking holidays in the laboratories of his friends in Europe and, when at home in New York, he would go to the physiological laboratory of the P. and S., tie his horse to a lamp-post, and with his coachman as assistant, perform some physiological experiment for the comfort of his conscience and the instruction of his mind.

I well remember a dinner of the Association of American Physicians, held in the spring of 1897, an affair then always participated in by a few physiologists, at which I sat between

Meltzer and Chittenden, and my father sat opposite. After the dinner my father took my seat and explained to them that he considered the success of his book on obstetrics was due to the fact that he had begun his life as a trained physiologist. It was the kind of a beginning that appealed to Meltzer.

Meltzer was a great believer in associations of scientific men. In the many societies to which he belonged he was the most active member, continually discussing the work presented, and often pointing out similar work which had been accomplished twenty, thirty or fifty years before. His knowledge was phenomenal.

He became dissatisfied with the quality of the men in many of our scientific societies, criticizing them for their lack of activity, and out of this dissatisfaction sprang in 1903 the Society for Experimental Biology and Medicine, sometimes affectionately called the "Meltzer Verein," a name which, when he first heard, he indignantly opposed. Meltzer's original idea was that the society should consist entirely of *workers*, and that those who did not produce should be automatically dropped. But once the society was formed, the exigencies of warm personal friendships did not allow of the execution of the proposed penalty. However, it represented the central idea of his mind as to what a scientific worker should be.

At one of the meetings of the American Physiological Society, when it was suggested that the number of papers read by any one man be restricted, Meltzer opposed the resolution and offered a substitute to make it obligatory for every member to present a paper.

Once I spoke to him of retiring from active work at some indefinite future date, to which he replied, "No, you will never do it. You cannot. You will go on doing the little things you are able to do until the end, just as I shall. There are only two things which would stop me from working. If anyone said to me, 'Meltzer, your work is no longer good' then I would stop, or if anyone said to me 'Meltzer, you can no longer understand a young man' then I would stop also."

I remember that one evening Meltzer came to talk with me regarding the establishment of the Harvey Society which was

designed to offer a forum for scientific speakers in New York. He opposed the idea at every point, saying that New York was not a scientific center and that there would be no audiences. Two or three days after that he telephoned me to call the meeting which had been proposed but I expostulated that he believed the affair doomed to failure. "Ah, but I have changed my mind," he replied. So the meeting was held with Meltzer in the chair and he overcame one after another all the arguments against the proposed society which a few days before he himself had felt as insuperable objections. Finally he said, "At any rate, we will all go and form a small group to encourage the speakers." At the first meeting Hans Meyer spoke and at the second this hall of the Academy was crowded to hear Carl von Noörden on the occasion of his first visit to America. And Meltzer's own lecture before the Harvey Society on the "Factors of Safety in Animal Structure and Animal Economy" attained world-wide celebrity.

A few years before this New York as a scientific center was pretty bleak and barren. In 1898–99 a few men, Lee, Herter, Dunham, Park, John Thatcher, Benjamin Moore, then in New Haven, and I, who were interested in laboratory work, met together informally at each other's houses and learned to know one another socially. This gathering was not resumed the following year. Then there sprang up a Society of Biological Chemists which met at regular intervals in the physiological laboratory of the New York University and Bellevue Hospital Medical College for the reason that this was the only institution to which access could then be obtained in the evening. This society afterward merged with the Society for Experimental Biology and Medicine and later gave its surplus of about a hundred dollars to help institute the Harvey Society.

It was in 1904, I think, after a meeting of the Society of Experimental Biology and Medicine that Meltzer drove me home from the P. and S. He took me across the park in his brougham drawn by a pair of horses. He said to me "I am going to give up all this. I am going to do what is nearest my heart. I am going to the newly founded Rockefeller Institute to spend the rest of my life in research. They allow me to practice medicine in so far as it pleases me, but my main desire is for experimental work."

This represented the spirit of his great love for scientific work. At one and the same time he not only fulfilled the desire of his life, but he renounced the material treasures of this world, and yet he remained free and untrammeled to do as he liked. On one occasion when I publicly mentioned this incident before him he regarded me with disapproval, and yet I believe it belongs to the story of his life. Very few men at the age of fifty-five would do likewise.

Meltzer was always a prominent figure at those international congresses which he attended. On such occasions the friendships between Meltzer and his old associate, Knonecker, were always warmly renewed. At the International Physiological Congress at Groningen in 1913 Meltzer, speaking in German, presented an eloquent and graciously worded invitation that the proposed congress of 1916 meet in New York. At the close of the speech a German turned to me and said, "Aber, Meltzer's Rede war schön!"

Like many of us who had known the better side of intellectual Germany, Meltzer was extremely cast down by the war. He sought to prepare the way for peace in his "Fraternitas medicorum" which was founded on the assumption that, since physicians of the Red Cross were bound to serve friend and foe alike, therefore, physicians themselves could readily resume friendly relations at the termination of hostilities. The supreme barbarity of modern warfare, however, has prevented the consummation of this altruistic hope.

Meltzer belonged truly to the younger men of his generation. For them he would make any sacrifice. He established the American Association of Clinical Research, the members of which were to be workers in the scientific sense. This society was so revolutionary that it earned the name of "The Young Turks." He was continually saying that in clinical medicine we had not yet reached a proper level of accomplishment, a level he hoped would still be attained in the future. It is usually hard for an older man to properly appraise those who are much younger than he. Liebig thought Voit a man without ideas, and Voit twenty years later knew of no prominent physiologist of forty years of age, at a time when Kossel and Hofmeister would both have been in-

cluded in that category. However, Meltzer was not of the type to grow out of touch with the young men whom he had always so greatly encouraged and his judgment of them was not to be ignored.

He said to me one day, "Your ideas concerning medical education are certain to be accepted—not because *you* say them, but because they are right." These heartening words only illustrate the helpfulness of his spirit as vouchsafed to many. Honest words of strong condemnation or criticism from his lips also meant much to those of us who knew the texture of the mind behind them.

Last spring he said to me, "If my good friends at the Rockefeller Institute, out of affection for me and solicitude for my welfare, insist that I leave my laboratory there, I want to know if you will not permit me to work in your laboratory." He asked the same privilege of others. In the face of pain and suffering the indomitable spirit of the man could not be overcome.

We remember how, time and time again, Meltzer has sat among the front seats of this Academy next to his old friend, Abraham Jacobi, and we are grateful to have known one who has added by his own work and by his own personality so richly to the growth of New York as a center of medical science. The story of his life is of value to us all. Once he proudly remarked, "I am of the race of which came Jesus Christ." And, in fact, there are few men of our time who more completely embodied all the Christian virtues.

Dr. Meltzer's influence on American Physiology.

By WILLIAM H. HOWELL.

Dr. Samuel James Meltzer was born in Curland, northwestern Russia, March 22, 1851. He received his preliminary education in a Real Gymnasium in Königsberg and his later training in the University of Berlin where he graduated in medicine in 1882. After taking his medical degree he decided to make his career in America, as the country which in his opinion had the best form of government. He had not sufficient means to make the journey and was therefore obliged to secure a position as ship's surgeon on one of the transatlantic vessels. On arriving in New York it was necessary in the beginning to devote his time mainly to building up a practise sufficient to support his family, but almost from the beginning he made arrangements also to give part of his time to research. From that period until his death on November 7, 1920, in his seventieth year he was a tireless investigator. When in the course of time the opportunity came to him from the Rockefeller Institute to give his time entirely to research he did not hesitate in making his decision. At a considerable financial sacrifice he abandoned his medical practise to devote himself to the kind of work that he most loved and most valued. By his good work and his high character he attained a position of honor and distinction in American medicine and endeared himself to his fellow-workers in all parts of the country. His productivity was remarkable. The list of his published papers includes over two hundred and forty titles, distributed among some forty-eight scientific journals of this country, Germany and England. These papers contain contributions to the subjects of physiology, pharmacology, pathology and clinical medicine together with a number of lectures and general addresses. That he was an investigator of recognized standing in these several branches of medicine and was regarded as a valued contributor to so many scientific journals of the first rank is a striking demonstration of the breadth of his interests and knowledge. He was a member of twenty or more

national scientific or clinical societies and in all of them it may be said he was prepared to take his part as an expert in the reading and the discussion of technical papers.

He served as president of the American Physiological Society, the Society for Experimental Biology and Medicine, the American Gastro-enterological Society, the American Society for the Advancement of Clinical Research, the Association of American Physicians and the American Association for Thoracic Surgery. The membership in these societies is composed of trained specialists. It is their custom to choose as their presiding officer only those who have made contributions of distinction to the subject to which the society is devoted. It seems to me unique in the modern history of medicine for one man to have received such special recognition from technical workers in so many different fields.

While his activities covered this large range he was interested primarily in physiology. "I belong," he said in a recent paper "to those who believe . . . that the knowledge of physiology is of special importance to clinical medicine." His work in this field entitles him certainly to be ranked among the foremost American physiologists. In attempting to present some estimate of the results of his labors I must limit myself mainly to his physiological activity. Indeed in this subject alone his papers are so varied that it will be possible to bring under review only what seem to be his major contributions. His first appearance as an investigator is recorded in a brief note in the *Proceedings* of the Berlin Physiological Society, May 14, 1880. In this note it is stated that Professor Kronecker exhibited a dog in which Herr Cand Med. Meltzer had cut the nerves going to the mylohyoid muscle and thus demonstrated the importance of this muscle in the initial stage of swallowing. At a later meeting of the society in the same year Kronecker presented the full results of an investigation carried out by Herr Cand. Med. Meltzer under his supervision on the "Process of Swallowing." This paper was published subsequently by Kronecker and Meltzer in the *Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin*, 1881. In this important contribution the mechanism of swallowing was given an entirely new interpretation which has since been generally

accepted and is known as the Kronecker-Meltzer theory of deglutition. Meltzer had attracted Kronecker's attention while a student in his course. Out of this acquaintanceship developed an invitation to engage in a research and eventually a warm friendship between the two men that lasted throughout life. Meltzer's career was thus determined while still a student of medicine. Kronecker's influence attracted him to physiology and set his feet in the paths of research. The investigation in which they collaborated was important and original—just what part each contributed it is not now possible to discover, but it is interesting to find that this initial venture into research furnished a motif which can be detected recurring again and again in Meltzer's subsequent work. A companion paper upon "Die Irradiationen des Schluckcentrums und ihre Bedeutung" was published by Meltzer alone in 1883. It is a very suggestive paper on account of the careful analysis it contains of the far-reaching and curious effects in the central nervous system of the act of swallowing and also because in it Meltzer announces certain views upon the importance of the inhibitory processes which subsequently formed the basis of his theory of inhibition, and remained with him throughout life as a sort of compass by which to set his course on his voyages of discovery. He calls attention in this work to the fact that reflex excitation of the inspiratory muscles is accompanied by reflex inhibition of the expiratory muscles and vice versa, and he goes on to make the suggestion that a similar relationship must prevail in the case of all antagonistic muscles such as the extensors and flexors of the limbs. Some ten years later Sherrington gave the necessary demonstration that this interrelation does hold with the muscular antagonists, that the contraction of the one is accompanied by the inhibition of the other and he designated this relationship under the term of "reciprocal innervation." Meltzer meanwhile had been accumulating instances of this combined action of excitation and inhibition, but he neglected at that period to apply a distinctive name to this kind of correlated activity. There can be no doubt that when it is possible to label an idea with an appropriate designation its currency in the scientific world is greatly facilitated. In his paper on "The Self-Regulation of Respiration" read before the Ameri-

can Physiological Society in 1889 and published in the *New York Medical Journal* and under a different title in the *Archiv. für Physiologie* he describes experiments intended to show that two kinds of afferent fibers exist in the vagus nerve, one exciting and the other inhibiting inspiratory movements. He used this fact to modify the Hering-Breuer theory of the self-regulation of the respirations by assuming that the expansion of the lungs stimulates both groups of fibers. The resultant effect, as in the case of the simultaneous stimulation of the motor and inhibitory fibers to the heart, is a dominance of the inhibitory effect, thus cutting short the inspiration and bringing on an expiration. But after the inhibition ceases the excitatory fibers, which, like the acceleratory fibers of the heart have a long after action, come into play and start a new inspiration. In his first general paper on inhibition this idea of a combined action of opposing processes is extended by the citation of numerous instances taken from physiological literature and is expanded into a general theory which makes inhibition a universal property of irritable tissues.

"I entertain and defend the view that the phenomena of life are not simply the outcome of the single factor of excitation, but they are the result of a compromise between two antagonistic factors, the fundamental forces of life, excitation and inhibition."

That is to say, whenever a tissue is stimulated two different processes are aroused, one leading to functional activity and one to a suppression of activity. As to the nature of these processes very little is said. He was not satisfied with the Hering-Gaskell conception that excitation follows or is an accompaniment of catabolic changes while inhibition is due to processes of an anabolic or assimilative character. He goes only so far as to assume that both processes are concerned with the kinetic and potential energies of the system, that excitation facilitates the conversion of potential to kinetic energy while inhibition hinders or retards this conversion, like the turning off or on of a stopcock. Nor was he satisfied with Sherrington's term of reciprocal innervation to describe all of the phenomena he had in mind. While this phrase is a suitable designation for the relationship between physically antagonistic muscles such as the flexors and extensors it is less appropriate in other cases, for example the simultaneous phases of

contraction and inhibition exhibited in peristalsis. In later papers he suggested first the term *crossed innervation* borrowed from von Basch, but subsequently adopted the designation of *contrary innervation* as more applicable to the whole series of phenomena which he was considering. This process he believed is universal in its action—it is "manifest in all the functions of the animal body." Moreover his experience and observation as a practising physician led him to believe that "a disturbance of this law is a factor of more or less importance in the pathogenesis of many disorders and diseases of the animal body." In this way he would explain in part at least the muscular incoördination in tabes and the gastric crises of that disease, as well as gastric and intestinal colic in general. If the orderly sequence of a peristaltic wave is disturbed so that the advancing wave of contraction meets a contracted instead of an inhibited area conditions are present which may well bring about a distension sufficient to account for the pain of colic. He gives many other illustrations of pathological conditions which may find a plausible explanation on the assumption of a disorder or disharmony in the law of contrary innervation. How far Dr. Meltzer was correct in the applications of his theory it is not possible to say. In all probability some of the specific instances that he cites in support of his views are amenable now to other explanations. But it is a fact, I believe, that he was much in advance of his earlier contemporaries in the emphasis he placed upon the significance of inhibition in the general activities of the body. The story is far from being told but it may be said that physiological thought since 1883 has tended more and more toward some such general conception of the rôle of inhibition as was in Meltzer's mind. For him at least it was a rewarding theory, it played, as he expressed it, a dominating part in all of his researches. One can not wholly appreciate his work nor understand his position on controversial points unless this attitude is borne in mind. His theory of shock for example to which he held tenaciously was that "the various injuries which are capable of bringing on shock do so by favoring the development of the inhibitory side of all the functions of the body." There is a shifting of the normal balance toward the side of inhibition.

The most important of his contributions in later years will be found in three series of researches, one dealing with the action of adrenalin upon the blood-vessels and the pupillary muscles; one with the inhibitory action of magnesium sulphate and the antagonistic effect of the calcium salts, and one with the development of his method of artificial respiration by pharyngeal and intratracheal insufflation. The first series consists of eight or nine papers, mostly in collaboration with his daughter. They showed in this work that the temporary action of adrenalin upon the blood-vessels may be converted into a long-lasting effect, in the case of the ear-vessels, if these vessels are first denervated by section of the vaso-motor fibers in the sympathetic and the third cervical nerve. A more striking result still was obtained for the iris. In the mammal subcutaneous injections of adrenalin in moderate doses have no effect upon the size of the pupil, but if the superior cervical ganglion is first excised then, after a certain interval, subcutaneous injections bring on a marked and long-lasting dilatation. His explanation of these phenomena was made in terms of his theory of inhibition. Whether or not his views in regard to the relations of the cervical ganglion to pupillary dilatation will stand the test of future experimental work it is to be noted that the observation itself constitutes a significant instance of a kind of independent physiological activity on the part of a peripheral ganglion. The bearing of these facts upon the prevalent conception of the rapid destruction of epinephrin in the tissues was brought out especially in a paper with Auer in which it was shown that if adrenalin is injected into a ligated limb and an hour or so afterward the ligature is removed the dilatation of the pupil quickly follows, thus demonstrating that for this long period the adrenalin had remained unaffected by the tissues. Incidental results of this series of experiments were his discovery of the use of the frog's eye as a biological reagent for the detection of small concentrations of epinephrin and the rapidity of absorption in intramuscular as compared with subcutaneous injections.

The work upon the inhibitory and anesthetic effects of magnesium salts gave rise to no less than twenty five papers, most of them published in collaboration with one or another of his associates but chiefly with Dr. Auer. The peculiar inhibitory action of

magnesium sulphate had attracted his attention as far back as 1899, and he reported upon it incidentally in a communication to the American Physiological Society. But in 1904–05, influenced again by his general conception of the importance of the inhibitory processes he took up with Auer a careful physiological study of its action. The results were most interesting and important. When given subcutaneously in certain doses the magnesium sulphate produces a condition of complete unconsciousness and muscular paralysis or relaxation, which is reversible, in the sense that when the animal is given proper care it recovers. Later he was able to show that out of this condition of profound depression or inhibition the animal may be restored to complete consciousness and motility with miraculous suddenness by the intravascular injection of small amounts of calcium chloride. No one who was fortunate enough to see this demonstration as given by Dr. Meltzer will forget its dramatic effect upon his audience. A healthy vigorous rabbit was brought quickly to a condition of complete immobility and apparent death by the magnesium sulphate and then even more suddenly raised from the dead and restored to its normal tranquil existence by the injection of some calcium chloride. Meltzer and his collaborators investigated various phases of this action of magnesium sulphate and all of the results obtained tended to strengthen in his mind the conviction that in magnesium he had discovered the element in the body that is especially concerned in the processes of inhibition. The antagonistic action of the calcium although exhibited in such a striking way was not in his opinion specific. His own experiments in connection with the results reported by other observers led him to the general view that calcium serves to balance the abnormal activity of the other kations, potassium, sodium and magnesium, whether this abnormal action is in the direction of excitation or of inhibition. Modern work upon the physiological significance of the inorganic constituents of the body fluids which was begun in Ludwig's laboratory, but was given its main impetus by the striking contributions of Ringer had concerned itself chiefly with the salts of potassium, sodium and calcium, which alone seemed to be sufficient to maintain normal conditions of irritability. Meltzer's work has shown that magnesium also has its place in this ancient

balance of powers through which the functional activity of protoplasm is controlled. One can understand that in arriving at these results he must have felt that he was approximating at least a demonstration of the correctness of his general conception of the rôle of inhibition in functional activity. In this as in all of his experimental work Meltzer was eager to give his results a practical application to the art of medicine. The possibilities of the use of magnesium salts as an anesthetic agent in surgical operations were tested with some success on human beings and more important still its efficacy in controlling the spasms of tetanus has had a wide and promising application.

His last extensive series of researches dealt with anesthetization and artificial respiration through pharyngeal and intratracheal insufflation. Something like twenty-eight papers, most of them in collaboration with pupils or assistants, were devoted to this subject. His interest in this topic seems to have been stimulated by the fact that in his use of magnesium sulphate for anesthetic purposes the chief danger lay in the inhibition of the activity of the respiratory center. To meet this difficulty he undertook a study of the methods of artificial respiration. The initial paper in 1909 by Meltzer and Auer described a method of artificial respiration by continuous insufflation of the lungs through a tracheal catheter. It was found that by this means not only could an animal be kept alive without the action of the respiratory movements to fill and empty the lungs, but that it furnished also a convenient and efficient method for anesthetization. The use of this method in animal experimentation and especially its use in human surgery of the thorax and facial region was apparent and on many occasions Meltzer sought to make known its advantages and to ask for an adequate trial of its merits at the hands of the practical surgeons. The method has found some acceptance and the application of the principle involved will no doubt be extended in the future as the technique of thoracic surgery improves. It was in recognition of the importance of this work that the American Association for Thoracic Surgery asked him, a physician and laboratory worker, to serve as their first president. It was natural that this work should have led him to consider the whole matter of artificial respiration in its relations to resuscitation after

accidents of various sorts. His general paper in the *Medical Record* for 1917 giving a history and critical analysis of the methods of resuscitation is an interesting and valuable contribution. He gives experimental data to prove that his device of intratracheal insufflation is the most efficient method of artificial respiration both for man and animals. But he realized that it is a method which requires special knowledge and training for its successful execution, and his broadening acquaintance with and interest in the practical aspects of resuscitation led him to experiment with the less efficient and less safe method of pharyngeal insufflation. He was a member of the three national commissions on resuscitation and served as chairman of the third commission. In connection with the duties of this service he devised a simple portable form of apparatus for pharyngeal insufflation which can be used with very little previous instruction and he demonstrated, with entire success I believe, that this form of apparatus is much more efficient than any of the so-called manual methods of resuscitation, or than any of the special machines for this purpose, pulmotors and lungmotors, which have been exploited commercially during the past few years. It was, I imagine, a sore disappointment to him that he was not able to convince his colleagues on the third commission that this apparatus met all the requirements for industrial and military use. It is probably the simplest and best instrument yet devised for artificial respiration as applied to man, and in institutions or industrial establishments where the need for artificial respiration may arise frequently and where special individuals may be instructed in its use it can be employed to great advantage. But it does require some little amount of training to use it properly—the average uninstructed man or woman can not be trusted to apply it intelligently, and for this reason the commission felt that it was wise to urge adoption of a manual method as the form of first aid which may be applied most successfully under ordinary conditions.

While the researches that I have attempted to summarize represent his most important contribution to physiological science, Dr. Meltzer kept in close touch with the progress in almost all branches of experimental medicine. He gave evidence of this interest in the publication of occasional papers on various topics or in articles

of a general character. Shock, cardiac arrhythmias, therapeutics of self-repair, hemolysis, thyroid therapy, edema are among the subjects upon which he wrote, but probably the most original and helpful of his general papers is his well-known Harvey Lecture, 1906, on "The Factors of Safety in Animal Structure and Animal Economy." He applied this engineering term in a convincing way to describe the reserve powers possessed by many of the mechanisms of the body. Doubtless the general conception involved had occurred to many others, but no one before him so far as I know, had developed the idea so comprehensively and made of this provision a leading factor in the adaptation of the economy to its environment. The happy phrase that he employed served to precipitate the loose thought upon the subject, and its frequent recurrence since in medical literature is proof that the conception which it expresses has found wide acceptance in scientific circles. It is evident that his own thoughts were turned in this direction by the work of Chittenden upon the minimum protein diet. While he accepted, of course, the facts demonstrated by this observer in regard to the possibility of maintenance upon a low protein diet he was not willing to believe that a minimum diet is also an optimum diet in relation to the various metabolic stresses to which the body may be subjected. The experiences of the great war may serve to show that he was correct in taking this position.

To do full justice to the influence exerted upon contemporary medical research by Meltzer's work would require a careful analysis of the entire medical literature of the period, for, as I have tried to indicate, his sympathies were very broad and his activity was great. In some measure, either as interpreter or contributor this influence was felt at many of the points of contact between medical science and medical practise. The border land between these subjects was in fact his special field of work. He had the spirit and ideals of the scientist, and knew at first hand what research work really means. He had experienced the labor and care and devotion required of those who aspire to increase knowledge. On the other hand he had a personal realization of the difficulties and necessities of medical practise and so was especially fitted to act as a sort of liaison officer between the two great wings of the medical army, the investigators who have the difficult task of discovering

new truths, and the practitioners who must learn to apply these truths to the preservation of health and the protection from disease. No one in our generation, I venture to say, was more useful in this country in bringing about a helpful and sympathetic understanding between the laboratory worker and the physician. As a physiologist he enjoyed the best opportunities and training of his period. He was equipped with the methods and technique that the subject owes to the great masters of the latter half of the nineteenth century. The more modern methods of physics and chemistry which seem to be essential for the new generation of physiological workers he did not possess, but he did not let this deficiency discourage him nor diminish in any way his activity in research. He had the wisdom to understand that the armamentarium with which he was provided was adequate for the accomplishment of much important and necessary investigation. He was no faint-hearted seeker after truth. There never was a time, I fancy, in his active life when his mind was not full of problems that he wished to solve and which he intended to solve in part at least with the aid of his experimental methods.

Dr. Meltzer was elected to membership in the American Physiological Society at its first annual meeting held in Philadelphia in December, 1888. From that time until his death he was perhaps its most faithful member in attendance, in the presentation of papers and in participation in the discussions and social intercourse. Other less heroic spirits might weary under the load of papers and seek respite and fresh air by frequent disappearances between acts, but this was never the case with Meltzer. He loved the meetings, he loved to listen to the papers and to take part in the discussions. He had something to say of value on almost every paper that was read. It is small wonder therefore that his position and influence in the society constantly increased in importance. He served as president from 1911 to 1913, but the older members know that before that time and since his advice was paramount in matters of policy as well as in the selection of officers. He was sincerely and deeply interested in the welfare of the society and believed in its importance as one of the major agencies concerned in the advancement of the cause of physiological research. What he had to say in regard to its policies was always

said in the opening meetings and in the plainest of terms, and if in his opinion it was necessary to be critical of either persons or things he never hesitated to express what was in his mind. His courage in stating his position in matters in which some personal criticism necessarily played a part in the discussion has often aroused admiration. He did not indulge in circumlocutions or euphemisms, but was entirely frank and direct. There could be no mistake as to what he thought and yet no matter how plainly and bluntly he might speak there was as a rule no offense taken, because it was evident to every one that what concerned him was not personalities but the principles involved. The American Physiological Society owes much to him for the sound policies and wholesome traditions which have characterized its history. I have not so much direct knowledge of the influence exerted by Dr. Meltzer in the numerous other societies of which he was a member. In the case of the Society for Experimental Biology and Medicine we know that he was its chief founder and for many years its primum movens—it was long known familiarly among scientific men as the Meltzer Verein. I have no doubt that in every organization with which he was connected his influence was always exerted on the side of the highest scientific ideals—no other position was possible for him. He was high-minded, courageous, sincere and optimistic. Age oftentimes lays a stiffening hand upon the scientific worker, causing him to shrink from the laborious routine of research, but with Meltzer there was never any indication of weariness or sense of failure. In spite of much ill-health and physical suffering in his later years he was full of hope and energy and determination in the pursuit of his scientific ideals and problems. Death came to him, as he would have chosen, while in his study and at his work. He was a good and faithful servant in the cause of medical research. Rewards came to him in the form of academic honors and membership in the most important medical and scientific societies, but I am confident that he found his greatest recompense in the joy of the work and in the affectionate appreciation of his many scientific friends.

The place of Dr. Meltzer in American medicine.

By WILLIAM H. WELCH.

It seems as though every side of Dr. Meltzer's life and work has been already touched upon. There is little I can add. At the same time I should regret very much not to have had the opportunity of coming here tonight and paying my tribute to the memory of one whom I have held dear ever since the beginning of our acquaintance, which dates from Dr. Meltzer's arrival in this country in 1883. The bond that brought us together was one already refered to; we were both pupils of Kronecker, I at an earlier time than Meltzer, when Kronecker was assistant to Ludwig in Leipzig. I had the good fortune of coming under the influence of Kronecker and enjoying a friendship which continued until his death. Everyone who had the opportunity of working with him, loved him. He took a special and permanent interest in all of his pupils.

When Meltzer came, or even before he came, I received a letter from Kronecker informing me that Meltzer was contemplating coming to this country, and inquiring whether it would be possible for him to secure some academic position. If Dr. Meltzer desired to secure an academic position when he came here, he was soon disillusioned when he saw what the conditions at that time really were.

Occasionally Meltzer would pour out his heart, and I have had a letter from him within the year, a very intimate one, giving the circumstances of his drawing out from his early environment. He describes in a very graphic way the small city in Russia where he lived with his family circle, a circle of very orthodox Jews with a remarkable love of learning but at the same time a very restricted horizon. There is no little pathos, and some romance which I hardly feel free to tell here, of the circumstances which led him, under the particular influence of one individual, to leave his home and go to Koenigsberg there to enter into another life, another spirit, another world of thought.

He came to this country in 1883 with an admirable training in medicine but with his interests centered in experimental physiology and particularly in that field of experimental physiology represented by Kronecker. Although a pupil in the DuBois laboratory, it can hardly be said that the character of DuBois' work was the one in which Meltzer was trained or which especially attracted him. He arrived here with a letter from Kronecker and appeared in the little laboratory where I had been for four or five years after my return from Germany—first one room, then finally three rooms in the old Bellevue Hospital Medical College. I was delighted to have him. I recall that about that time Dr. Lange, the surgeon, was working in the laboratory before he had established himself in practice, and I could not give Meltzer a separate room. He had merely a corner in the laboratory and he was a faithful attendant there. He came every day as I recall it, usually in the afternoons, and there we undertook and published together a little piece of research, Meltzer's independent work practically. I never quite followed him in some of the broader views he subsequently elaborated and based upon that work as to the importance of vibratory movements in living matter. In that apparently detached kind of study he had a breadth of view somewhat philosophically tempered.

That association which was a great delight to me lasted one year. He then moved to Dr. Prudden's laboratory. Dr. Prudden and I had started our laboratories at about the same time. Those laboratories were then practically the only ones in New York where anyone who desired to do any kind of biological or medical laboratory work, could come. There can be no greater contrast than the conditions in those very modest little laboratories and the splendid equipment of today. This is possibly a good illustration of the "lowlands" of those days as compared to the "heights" of today, and no small influence in bringing this about was that of Meltzer's. But although working for a time in the laboratory of the College of Physicians and Surgeons, most of his research was done in his own little house, often late at night.

I would like to emphasize what I think is the marvel of Meltzer's life and work, that remarkable and almost unique combination of active medical practice with the cultivation of a particular

science, experimental physiology by laboratory methods. There have been physicians, especially in their younger and lean years, with scientific inclinations who have done excellent work in the laboratory but only for a time; ultimately they were practitioners. There have been practitioners, as for example S. Weir Mitchell, who have continued to be interested in experimental work, but after all they are not comparable to Dr. Meltzer, who combined in an extraordinary manner the life of the practitioner and the life of the real specialist in experimental physiology. It is worth pausing to consider this because it is a remarkable phenemenon. Meltzer must have exerted no little restraint not to allow himself to become so immersed in practice as to cause him to withdraw from his scientific activities.

The first ten years after his arrival were years in which he produced something nearly every year. There were some years, 1884–85–86, of relatively little productivity. In general the period from 1883 to the early nineties of the last century was one in which he was establishing himself in a comfortable practice; he desired no more. He had to make his livelihood and this was the only congenial way open to him, but he did not allow himself, even during these early years, to be withdrawn from scientific interests and work. It shows a remarkable loyalty to an ideal and a very extraordinary enthusiasm and tenacity of purpose to have accomplished this under conditions apparently so adverse. Once established in a comfortable practice, his scientific interests bore upon his practice and his practice bore upon the character of his scientific progress, as has been already pointed out.

Dr. Howell has given us an admirable characterization of Meltzer as the experimental physiologist who occupies by preference that border land between laboratory and practice, a type quite incomprehensible to the ordinary practitioner.

Meltzer was one of the few earlier physicians in this country whose practice was based upon physiological training, aptitude and interest. S. Weir Mitchell was another, although his interests became mainly clinical. If Dr. Graham Lusk had not already referred to it, I was going to speak of his father also, as another man who, in his special field of obstetrics, founded upon physiological study and interest, made admirable the work of the scientific practitioner in this field.

In those early years when Meltzer came to New York, the leading physicians were Jacobi, Clark, the elder Flint, Delafield and Janeway, the scientific basis of whose work was mainly pathological anatomy. From this school of pathological anatomists most admirable practitioners have come; but today we recognize that the study of function is essential to make the good doctor, and we must bear in mind that Meltzer typified this idea when scarcely any one else in the country did so.

In the early nineties Meltzer's productivity amounted to many papers a year, and so continued to the end. It is interesting to consider why. In the first place he was in easier circumstances, not uninterested in his practice, but easier in his circumstances so far as time to give to his work went. Then it was a time too, when there were great advances in scientific and medical education. Laboratories were established in various schools in the country. I wish to emphasize also the formation of special societies such as the Association of American Physicians, devoted to the various specialties, particularly the Physiological Society, where Meltzer played the very important part indicated by Dr. Howell. At this time too, there came the establishment of journals devoted solely to the publication of technical research. They not only provided a much needed means for publication, but they were positively stimulating to the production of research. The first of these was the *Journal of Experimental Medicine* started in 1896, soon followed by the *Journal of Physiology* and then by others. The organization of these special societies, the new media of publications, gave Meltzer his opportunity, and how well he used it, how much a part of this development he was, has been indicated here tonight.

And now, just a little more about his relation to the clinical side. He represented the physiological type of physician. He was, I understand from competent sources, really an accomplished physician, doing full justice to his patients. His influence on clinical medicine however, is not to be measured by his accomplishments merely as a physician. He was never weary of impressing especially upon the younger generation of physicians, that the field of clinical research is just as interesting, as rewarding, as important and just as capable of scientific advancement by re-

search as that of physiology or the other branches of medicine to which the term "science" is sometimes, although erroneously, limited.

Meltzer realized that it is the younger generation that is especially worth working for and trying to influence. He made no mistake. It is delightful to see so many of the younger men here tonight, because I know they are drawn by their affection and admiration for that man who impressed his ideas upon them not only by precept, but by example. In this way, I think, he has exerted a potent influence upon clinical medicine, and I question whether it would have been possible for a man devoting himself solely to laboratory work to have done this.

His great opportunity came when he was chosen for the headship of the division of Physiology and Pharmacology of the Rockefeller Institute. It was a natural choice. The institute was in its early days and it was extremely important that the particular problems selected for study should fall within a certain, at that time, well-defined group of subjects. Here was a man who was a genuine physiologist, recognized by his compeers, but whose interests were largely concerned with problems having relation to practical medicine, although he would have been the last man in the world to advocate that practical application of results should be a guiding principle in discovery. He represented that combination of quality and direction of interest in scientific medicine which made him the ideal man for the new division of physiology and pharmacology. He found here his great opportunity for his splendid work. He was brought into contact with young men and he helped train them here.

As a member of the Board of Scientific Directors of the Rockefeller Institute, I wish on this occation, to express on behalf of all my colleagues, and I am sure I speak also for all the scientific workers at the Institute, our sense of personal loss, our very grateful appreciation of Meltzer's life and work and our inexpressible debt to him for his many years of devoted and fruitful service. I am glad to have had the privilege of saying these few words in memory of one whose character I greatly admired and whose friendship I cherished. It is well for all of us to come and pay our tribute to the memory of such a man; to recall his worthy

qualities of heart, mind and character, his large and enduring influence, his accomplishments and his genius. But after all, it is still better for us, and that is what he would wish, that we leave here animated by his spirit and by his desire to cultivate scientific medicine and to serve our fellow men.

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